CO-TRANSCRIPTIONAL ASSEMBLY OF MODIFIED RNA NANOPARTICLES

SUMMARY

The National Cancer Institute's Nanobiology Program seeks parties interested in collaborative research to co-develop a method to generate RNA molecules suitable for nanoparticle and biomedical applications.

REFERENCE NUMBER

E-223-2012

PRODUCT TYPE

- Therapeutics
- Diagnostics

KEYWORDS

- Drug Delivery
- RNA
- Nanoparticle

COLLABORATION OPPORTUNITY

This invention is available for licensing.

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DESCRIPTION OF TECHNOLOGY

The National Cancer Institute's Nanobiology Program seeks parties interested in collaborative research to co-develop a method to generate RNA molecules suitable for nanoparticle and biomedical applications.

The development of nanoparticles as a method of drug delivery is paving the way for precise targeted therapy making it a more attractive and effective method for treating cancer. However, the current methods of designing RNA nanoparticles are limited by three factors: 1) the cost and size limitations associated with chemical synthesis of RNA; 2) the complexity of RNA nanoparticle production; and 3) low retention time of RNA nanoparticles in the patient bloodstream due to their susceptibility to nuclease degradation.

NCI scientists have developed a method to overcome these challenges in RNA nanoparticle design. The method entails generating RNA nanoparticles having modified nucleotides and/or having increased nuclease resistance where the RNA nanoparticles are formed co-transcriptionally by T7 RNA polymerase in the presence of manganese ions. In essence, the technology results in high-yield production of chemically modified RNA nanoparticles functionalized with siRNAs that are resistant to nucleases from human blood serum

POTENTIAL COMMERCIAL APPLICATIONS

- Inexpensive and efficient method of producing chemically modified RNA nanoparticles for diagnostic or therapeutic applications.

COMPETITIVE ADVANTAGES

- Reduces the cost and size limitations of solid-phase RNA synthesis.
- Simplifies production of complex RNA nanoparticles.
- Increases retention time of RNA nanoparticles.

INVENTOR(S)

- Bruce A. Shapiro (NCI), Kirill Afonin (NCI), Maria Kireeva (NCI), Mikhail Kashlev (NCI), Luc Jaeger (Univ California, Santa Barbara), Wade Grabow (Univ California, Santa Barbara)

DEVELOPMENT STAGE

- Discovery (Lead Identification)

PUBLICATIONS

- Afonin KA, et al. [PMID 23016824]
- Grabow WW, et al. "RNA Nanotechnology in Nanomedicine," in Nanomedicine and Drug Delivery (Recent Advances in Nanoscience and Nanotechnology), ed. M Sebastian, et al. (New Jersey: Apple Academic Press, 2012), 208-220. [Book Chapter]

PATENT STATUS

- **Not Patented**

RELATED TECHNOLOGIES

- E-059-2009 - In Silico Design of RNA Nanoparticles
- E-038-2012 - Selective Treatment of Cancer Cells, HIV and Other RNA Viruses
- E-039-2012 - Targeted Nanoparticles for the Treatment of Virus-infected or Cancerous Cells

THERAPEUTIC AREA

- Cancer/Neoplasm